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TESTS OF A STRESS-CARRYING DOOR IN COMPRESSION

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RESTRICTED BULLETIN

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By Robert Gottlieb

The results of torsional tests on a monocoque box containing a stress-carrying door were presented in reference 1. The present paper gives the results of bending tests on the same box with the door on the compression side. The details of the box and the location of the applied forces are shown in figure 1. Outside and inside views of the stress-carrying door are shown in figure 2.

Vertical loads of 1000, 2000, 3000, and 4000 pounds were applied at the free end of the box. The chordwise stress distribution at station 27.75 (see fig. 1) is shown in figure 3 for the case of cut-out, cut-out with door, and no cut-out.

The effectiveness of a stress-carrying door depends on the intended function of the door. If the function of the door is considered to be that of reducing the maximum compressive stresses around the cut-out, a measure of the effectiveness of the door is the ratio of the stresses a/b. (See fig. 3.) If the function of the door is considered to be that of carrying load from one end of the cut-out to the other, a measure of the effectiveness of the door is the ratio of the areas

$$\frac{\text{double-shaded area}}{\text{entire shaded area}}$$

The entire shaded area represents the load-carrying capacity that was lost when the cut-out was made; the double-shaded area shows the amount of this load-carrying capacity that was recovered when the door was placed in the cut-out.

In figure 4 these two measures of the effectiveness of the door in compression are plotted against the applied load at the tip of the box. These curves indicate that the door becomes effective in carrying loads across the cut-out at a load of approximately 1500 pounds and that it becomes effective in reducing stresses at a load of

approximately 2300 pounds. The effectiveness increases rapidly as greater loads are applied. The door is ineffective at low loads because of the clearance provided between the door and door frame to allow easy removal of the door at zero load. Before the door can become effective in compression, the material on each side must be deformed sufficiently to take up this clearance.

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National Advisory Committee for Aeronautics,
Langley Field, Va.

REFERENCE

1. Gottlieb, Robert: Test of a Stress-Carrying Door in Shear. NACA R.B., Aug. 1942.

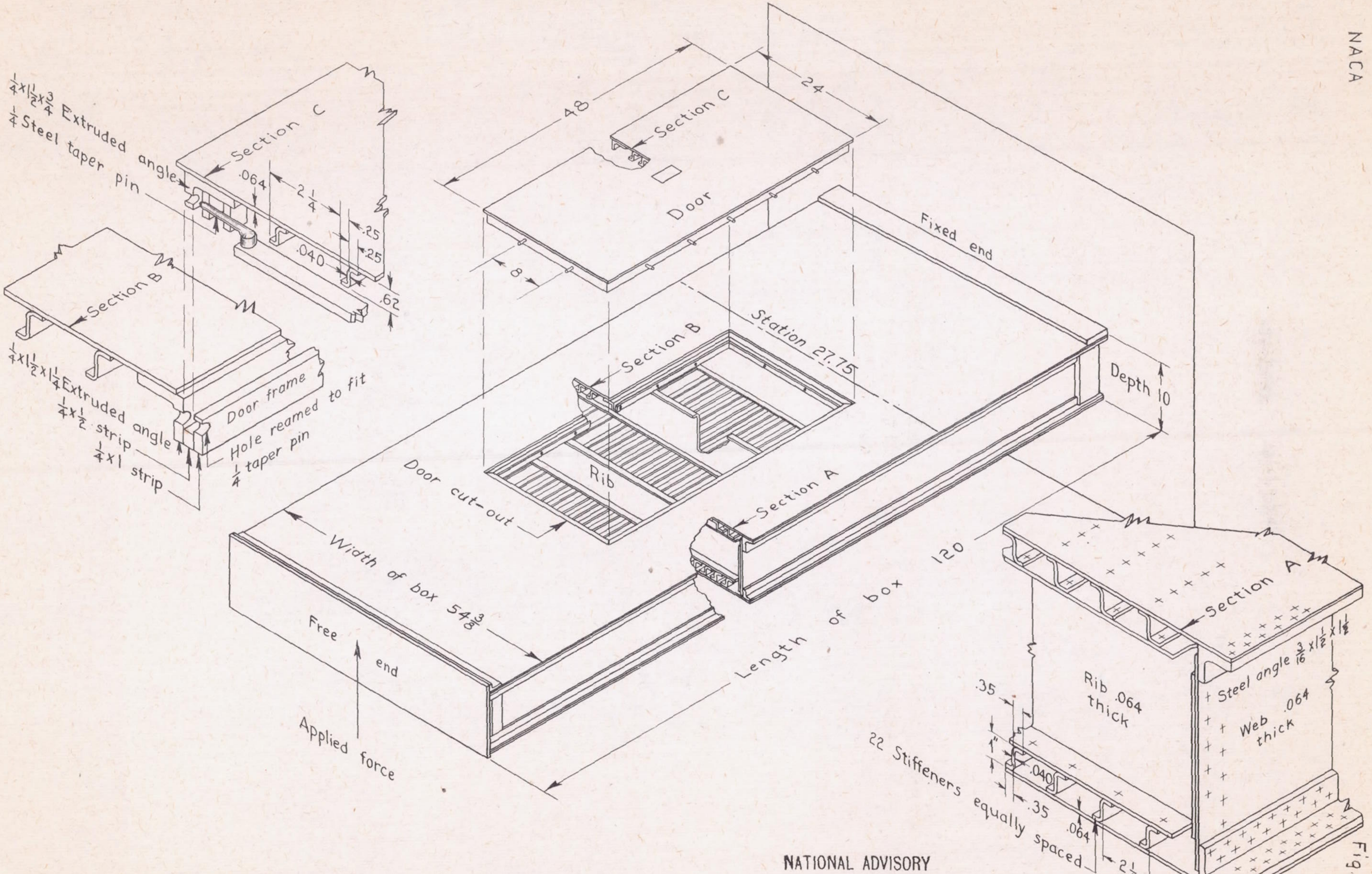

Figure 1. ~ Details of box and stress-carrying door.

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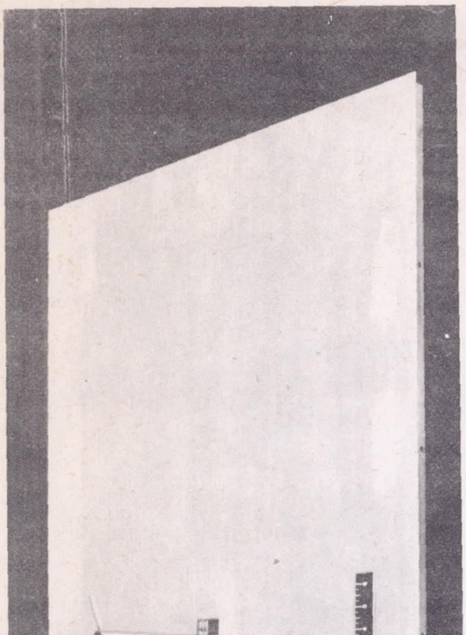
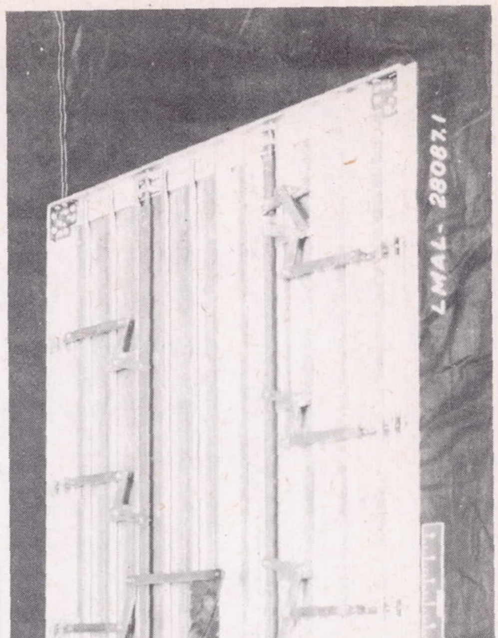


(A). - Outside.



(B). - Inside.

Figure 2. - Stress-carrying door.

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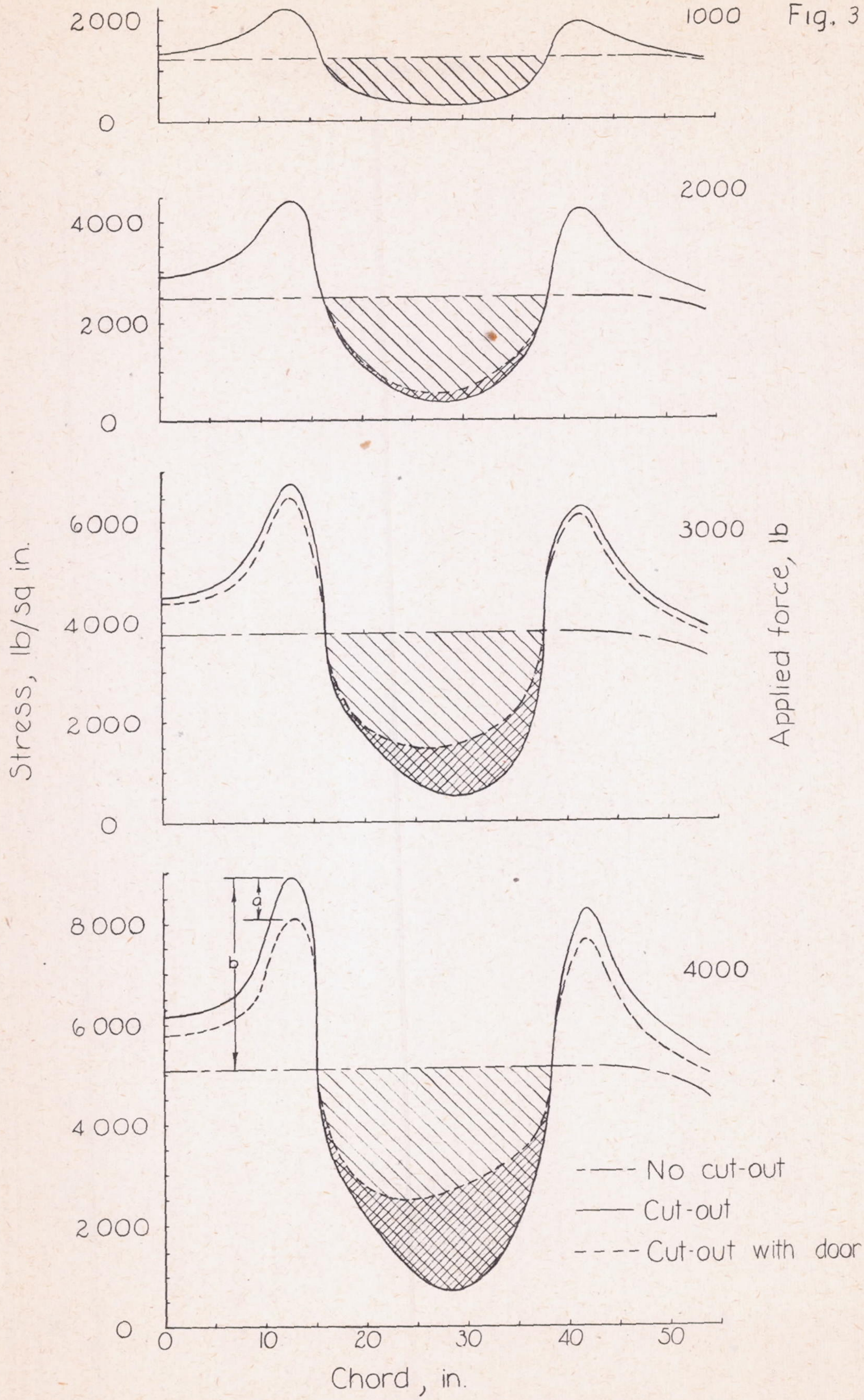

Figure 3.- Chordwise stress distribution at station 27.75.

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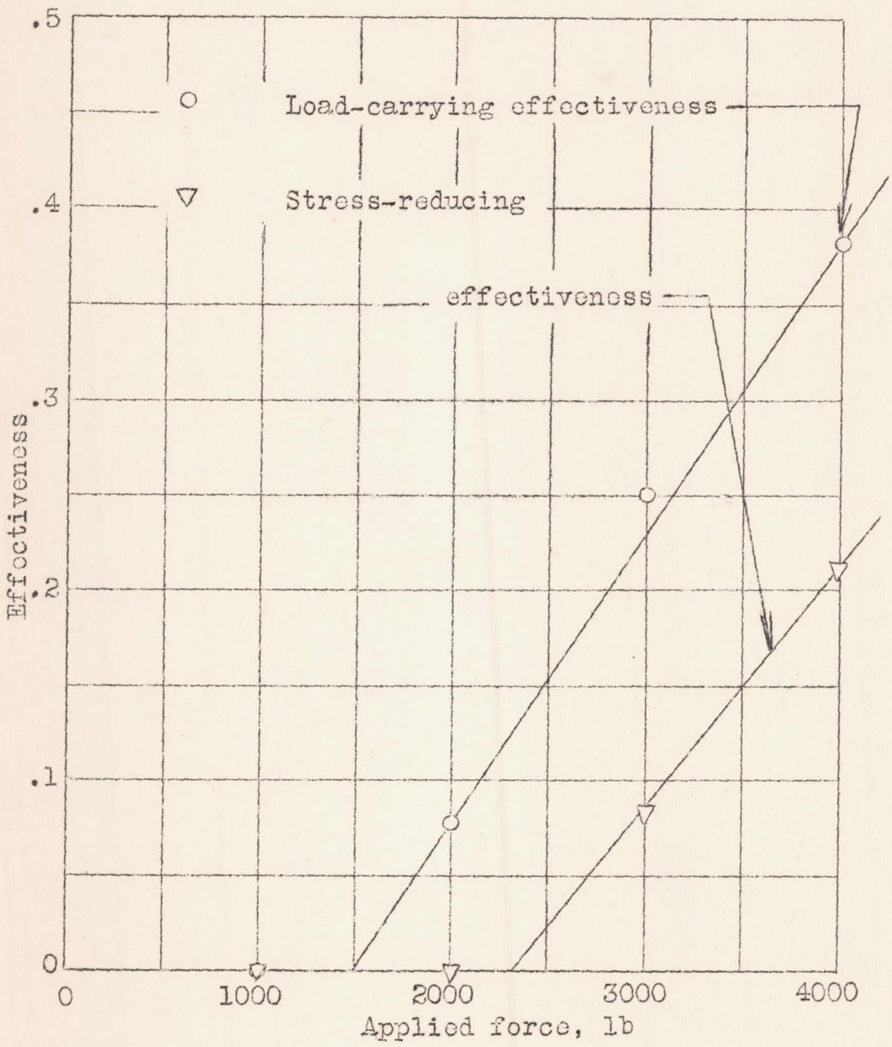

Figure 4.- Effectiveness of door.